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# PLANETARY PHENOMENA FOR JANUARY AND FEBRUARY, 1916.

By Malcolm McNeill.

### PHASES OF THE MOON, PACIFIC TIME.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| New Moon ... | Jan. | 4, | $8^h 45^m$ P.M. | New Moon... | Feby. | 3, | $8^h$ $6^m$ A.M. |
| First Quarter. | " | 11, | 7 38 P.M. | First Quarter. | " | 10, | 2 20 P.M. |
| Full Moon ... | " | 20, | 12 29 A.M. | Full Moon ... | " | 18, | 6 29 P.M. |
| Last Quarter. | " | 27, | 4 35 P.M. | Last Quarter. | " | 26, | 1 24 A.M. |

There will be five eclipses during 1916, three of the Sun and two of the Moon.

The first, *a partial eclipse of the Moon* on the night of January 19-20, will be visible generally thruout the United States. The circumstances of the eclipse are as follows, Pacific Time:—

| | | | |
|---|---|---|---|
| Moon enters penumbra ...... | January | 19, | $10^h$ $5^m$ P. M. |
| Moon enters shadow......... | " | 19, | 11 55 P. M. |
| Middle of the eclipse......... | " | 20, | 12 39 A. M. |
| Moon leaves shadow ........ | " | 20, | 1 24 A. M. |
| Moon leaves penumbra ...... | " | 20, | 3 14 A. M. |

The greatest magnitude of the eclipse is about one-eighth of the Moon's diameter.

The second is *a total eclipse of the Sun* on February 3d, visible as a partial eclipse thruout the greater part of North and South America, Western Europe and Northwestern Africa. The line of totality begins at sunrise in the Pacific Ocean, runs nearly due eastward, crossing the extreme northwestern part of South America a few miles south and east of Panama, thence northeastward across the Atlantic, ending at sunset westward of the English Channel. The maximum duration of totality is small, $2^m 36^s$.

On the night of January 14-15 the Moon will occult a number of stars of the *Pleiades* group, the immersions coming at the dark limb.

At the beginning of January *Mercury* is an evening star, setting not quite forty minutes after sunset. Its apparent distance from the Sun increases somewhat rapidly, and by the middle of the month the interval has increased to an hour and one-half. The planet will then be an easy naked-eye object in the evening twilight. Greatest east elongation is reached on January 20th, 18° 40′, rather a small one, as the date of perihelion passage is less than a week later. This also causes a diminution of the period of naked-eye visibility, as the planet's motion when near perihelion is rapid. After greatest east elongation the gap between planet and Sun closes up rapidly, and inferior conjunction is reached on February 4th, the planet becoming a morning star. The apparent distance between Sun and planet now increases rapidly and greatest west elongation is reached on March 1st. During the latter half of February the planet rises more than an hour before sunrise, and may be seen in the morning twilight under good weather conditions.

*Venus* is an evening star gradually moving eastward from the Sun. On January 1st it sets a trifle more than two hours after sunset, and this interval is increased to more than three hours by the end of February. Its motion among the stars is rapid, rather more than one degree a day eastward, and not quite half as much northward. It is in rather a barren region of the sky, moving from a point in *Capricorn* thru *Aquarius* to the eastern part of *Pisces*. On February 13th it passes not quite 1° south of the Vernal Equinox, and a few hours later is in conjunction with *Jupiter*, the latter being 27′—less than the Moon's apparent diameter—to the south.

The present two months' period affords the best view of *Mars* since January, 1914. The planet comes to opposition with the Sun and makes its nearest approach to the Earth on February 9th. On January 1st it rises a little earlier than 9 P. M., and by the end of February shortly after 3 P. M. From January 1st until nearly the end of March its motion among the stars is retrograde, that is westward; at the end of February its position is 17° west and 6° north of its January 1st place. On February 9th, at the time of opposition, its distance from the Earth is a little less than 63 millions of miles, 14 millions less than on January 1st, and 4 millions less than on March 1st. At opposition its brightness in stellar magnitude is — 1; this is more than twice as bright as it was on January 1st, and this was about twice as bright as *Regulus*, the bright star near it in early January.

The present opposition is about the most unfavorable which can occur, as it comes when *Mars* is near aphelion, while the Earth is near perihelion. When opposition occurs in August the conditions are reversed. The next August opposition occurs in 1924. The least distance between Earth and planet will then be less than 35 millions of miles, only 55% of the present opposition distance, and the planet will then be three times as bright as it is in February. The interval between successive oppositions varies from a little over 760 days for winter oppositions to a little more than 800 days for summer oppositions. The next opposition will occur March 15, 1918, 764 days from the present one.

*Jupiter* is an evening star thruout January and February. On January 1st it sets a little before eleven o'clock and shortly before eight at the end of February. It is in the constellation *Pisces* and moves about 11° eastward and 5° northward during the two months. On February 9th it passes a little more than 1° south of the Vernal Equinox. Its conjunction with *Venus* on February 13th has been mentioned. *Venus* will then be more than a full magnitude brighter than *Jupiter.*

*Saturn* is in fine position for evening observation, coming to opposition with the Sun on January 4th. It is then above the horizon thruout the entire night. By the end of February it will set at about $3^h 30^m$ A. M. It is in the constellation *Gemini,* south and west of *Castor* and *Pollux,* the brighter stars of the constellation, and retrogrades, moves westward, about 4° during the two months. It is about one magnitude brighter than the brighter of the two. As seen in the telescope the minor axis of the rings is nearly at its maximum, a little more than the polar diameter of the planet.

*Uranus* passes conjunction with the Sun on February 5th, and is too near it for naked-eye view during January and February.

*Neptune* is in the constellation *Cancer* and is above the horizon during the greater part of the night, but is too faint to be seen without a telescope.